A.D. 1891. JAN. 13. Nº 654.

QUERTAIN & *another's* COMPLETE SPECIFICATION.

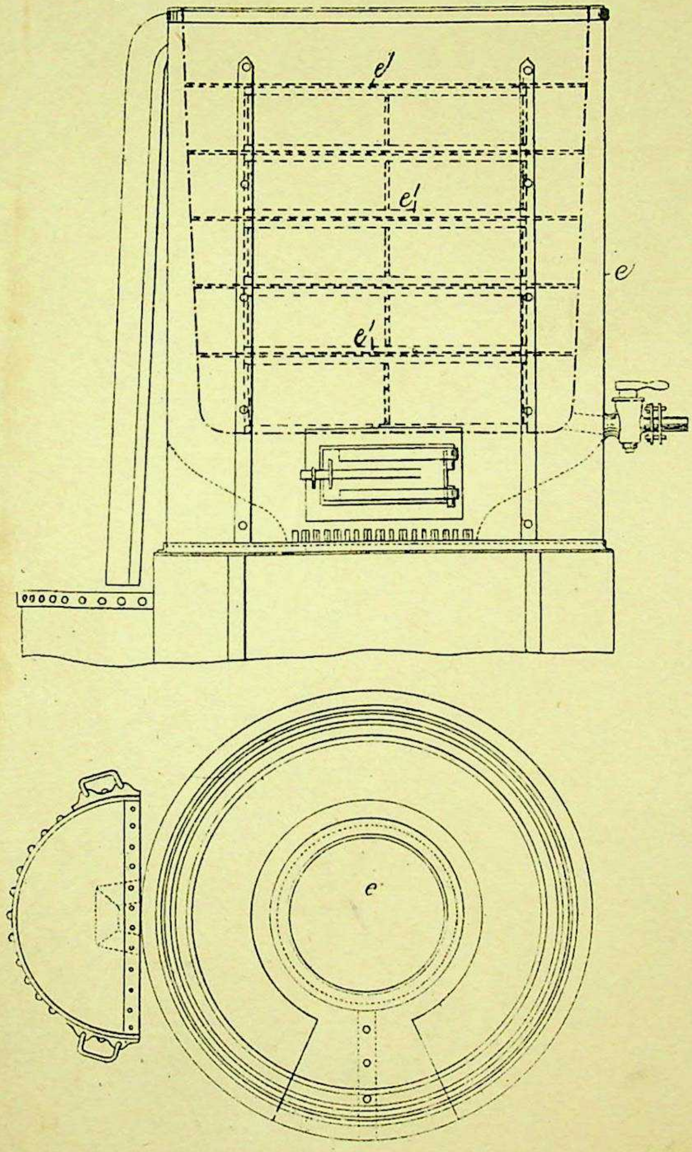
SHEET 1.

~~195. ALCOHOL.~~
~~Mashing-~~
Processes.

~~32~~
18

Ry 654
1891

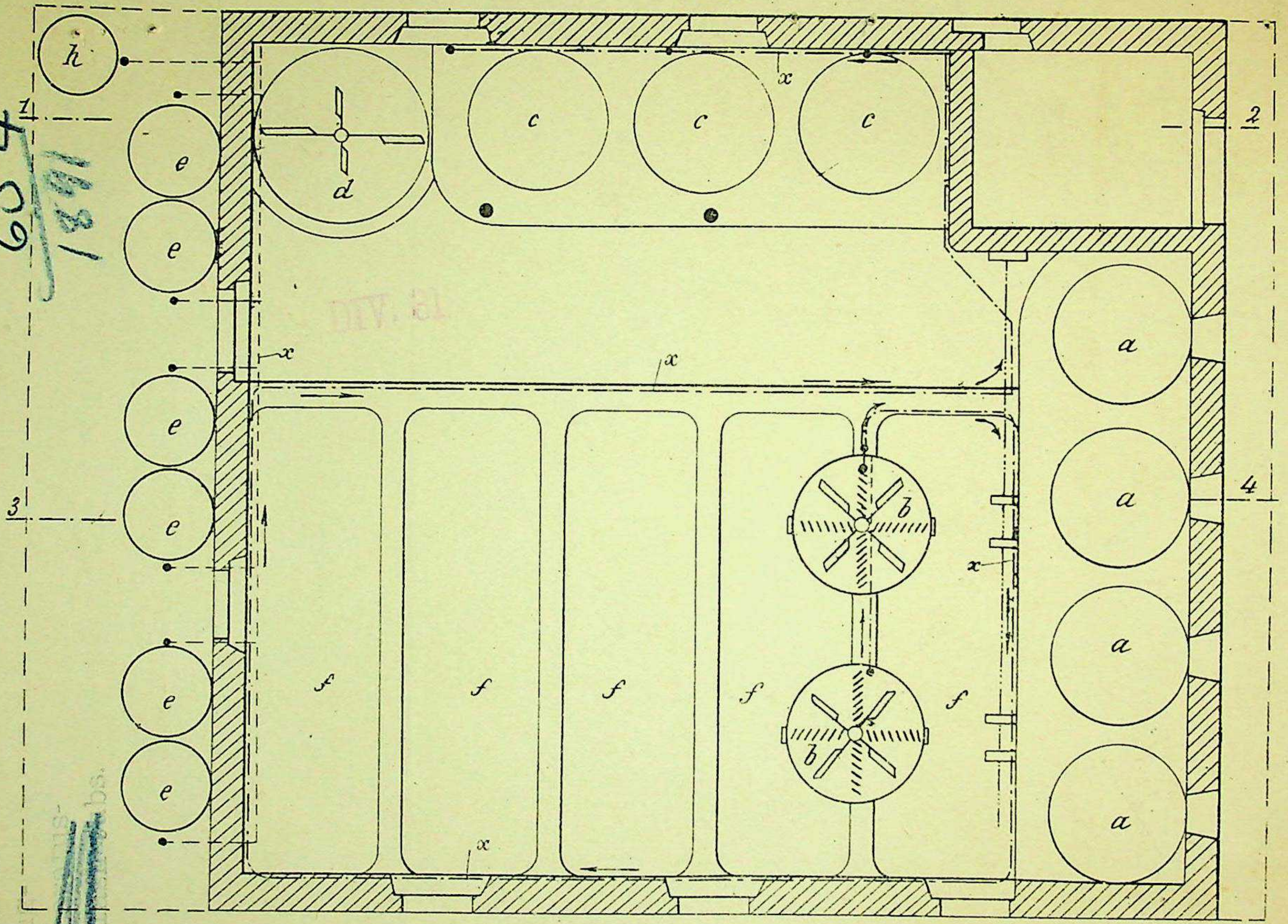
FIG. 1.



654 - 91

195. ALCOHOL,
Mashing-
Apparatus.

FIG. 2.



[This Drawing is a reproduction of the Original on a reduced scale.]

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195 ALCOHOL, Mashing-
bs.

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Malby & Sons, Photo-Litho.

99. FOODS AND BEVERAGES
426/29
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①
97/5
Mash Proc
RECORDED
31

N° 654 A.D. 1891

(*Under International Convention.*)

Date claimed for Patent under Sect. 103 of Act, being date of first Foreign Application (in Belgium), 14th June, 1890
Date of Application (in United Kingdom), 13th Jan., 1891
Complete Specification Left, 13th Oct., 1891—Accepted, 13th Jan., 1892

PROVISIONAL SPECIFICATION.

Improvements in the Process of and Apparatus for Brewing Beer.

We Daniel Quertain of Lobbes Belgium Manufacturer and Hysolphe Becker of Charleroi Belgium Manufacturer do hereby declare the nature of this invention to be as follows:—

Our invention consists of a new process for the brewing of beers by one continuous work and by natural decantation by means of new or improved apparatus, and the object of the invention is to obtain a more rapid manufacture to prevent evaporation, to prevent the formation of a head, and to obtain a beer as strong as those now manufactured, at the same time employing a less quantity of malt.

According to our invention the malt is first mashed as usual in an ordinary mash tub provided with a pounder, containing water which is heated to the desired degree.

The wort obtained after mashing is then conveyed through refrigerating pipes, surrounded by cold water, into cooling vats, whence, after it has cooled sufficiently, it passes into a collecting vat provided with a stirrer. From the collecting vat it is then raised by means of a pump or otherwise into the purifying apparatuses, each of which consists of a boiler placed over a fire box and divided by means of filters into a number of compartments situated one over the other.

In these purifying apparatuses the wort is subjected to a first boiling for about two hours during which time it is thoroughly skimmed.

After this operation the wort is again passed through the refrigerating pipes which convey it into the cooling vats again, whence it again passes into the collecting vat in order to be raised from there into the purifying apparatuses for the second time where it undergoes a second boiling for about two hours during which the skimming is continued.

During this second boiling the hops previously distilled are added to the wort, such hops having, in order to obtain the quintessence thereof, been distilled in a special apparatus of a construction similar to that of the purifying apparatuses.

After this second boiling the mixture of wort and distilled hops is again conveyed through the refrigerating pipes, but this time without passing into the cooling vats and the collecting vat; it is conveyed to and collected in the decanting vats where it is allowed to lie for a long time more or less, according to the strength of the beer, until the time arrives for drawing it off into casks.

The entire work is done in a closed vessel, and one single plant is sufficient for effecting one continuous work.

Dated this 13th day of January 1891.

W. T. WHITEMAN,
Agent for the Applicants.

[*Price* 8*d*.]

COMPLETE SPECIFICATION.

Improvements in the Process of and Apparatus for Brewing Beer.

We, DANIEL QUERTAIN of Lobbes, Belgium, and HYSOLPHE BECKER of 23, Rue de l'Aquéduc, Charleroi, Belgium, Manufacturers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The plant employed in this improved process of brewing is represented in Figures 1. 2. 3. and 4 of the drawings;

Figure 1 being an elevation and plan of one of the purifiers,

Figure 2 a plan of the entire plant for a continuous manufacture of 100 hectolitres per day, and

Figures 3 and 4 cross-sectional elevations taken on lines 1—2, 3—4, of Figure 2 respectively.

Figure 5 shews sectional views of the refrigerator.

The plant comprises:—

(1) Four coppers *a* for heating the water of a capacity of 2650 litres each, placed at a height of 3 m. 20 above the ground. This arrangement permits of running into the mash tuns water at the proper temperature.

(2) Two mash tuns *b* each of a capacity of about 4000 litres, provided with stirrers driven by power placed on a lower level than the coppers from which the water is supplied by means of movable pipes connected to cocks on the coppers. By employing two mash tuns a continuous operation is ensured enabling a production of 100 hectolitres per day. Each mash tun is enclosed in a light sheet metal jacket with an intermediate space of about 5 centimetres for the circulation of steam from the boiler of the engine which being continually renewed during the mashing maintains the contents of the mash tuns at a normal temperature of about 75° C.

(3) Three cooling vats *c* placed at a lower level than the mash tuns which receive the wort after saccharification through a compressed air refrigerator which may consist of concentric pipes which would usually be led along the walls of the brewery, as indicated by the dot and dash lines *x x* in Figure 2, and be constructed, as shewn in Figure 5, of pipes *k* of flattened or circular section supported centrally by wires *l* within an outer tube *m* of corresponding form so as to leave an annular space between them. The vats *c* are each of a capacity to contain about 3500 litres of wort so as to permit of a more prompt cooling. One of these vats may be reserved for any other use required. The arrows in Figure 2 shew the circulation of the wort between the mash tuns *b* and cooling vats *c*.

(4) A circular vat *d* for receiving the cooled wort, of a capacity of about 7000 litres and provided with a stirrer to prevent the wort settling before it is raised into the purifying apparatus by a pump driven by the engine.

(5) Six purifiers *e* each of a capacity of about 1126 litres, placed at a height of about 2 m. 10 c. from the ground into which the wort is pumped as above mentioned and subjected to a first boiling for about two hours during which it is kept constantly skimmed. Each of the purifiers is provided with a series of superposed filters e^1 (Figure 1) preferably made of perforated sheet copper over which the wort is caused to pass to and fro so as to prolong its traverse, and also with a cover furnished with an alarm whistle to indicate when the contents have attained a temperature of 90° C., the cover being slid to one side to prevent the liquid being thrown out and overheating and thus gradually attain ebullition at atmospheric pressure. After this operation the wort is discharged through the refrigerator into the three cooling vats *c* and passes thence into the vat or reservoir *d* whence it is re-pumped into the purifiers to be subjected to a second boiling. The beer thus purified and well boiled is passed through the refrigerator into the decantation tanks *f* where it is allowed to remain five days after which it

passes through pipes without access of air and light into clarifying tanks of stoneware or tuns contained in the cellars *g* which are so constructed as to be always cool. The clarification and decantation are performed in from 10 to 90 days according to the quality of the beer.

(6) A special apparatus *h* (Figures 2 and 4) similar to the purifiers, for boiling hops to obtain an extract thereof which is conducted into an adjoining reservoir. The hops are first introduced into the apparatus containing a single filter only at bottom which is then filled with wort and after boiling one hour the decoction is cooled and then again passed through the apparatus in which the remaining filters have meanwhile been placed and again boiled for one hour to obtain the complete dissolution of the resin. The whole is then returned into the vat *d* and thoroughly mixed with the wort before undergoing the second boiling as before described. To each hectolitre of wort is added 250 grammes of this extract before the second boiling of the wort in the purifiers.

(7) A water-tank *j* (Figure 4) of large capacity placed above the three cooling vats *c* at such a height as to supply the water heating coppers and the refrigerator. This reservoir is filled by a special pump driven by the engine.

Brewing operation. The purifying apparatus fulfils a two-fold purpose serving as it does to perform all the operations of brewing properly so-called *viz.* the formation of the wort and the infusion of the hops whilst experience shews that the two successive boilings in this apparatus most effectually perform the brewing operation.

The combined use of the various apparatus constituting the plant hereinbefore referred to, possesses the double advantage of accelerating the manufacture, preventing evaporation inasmuch as the purification takes the place of fermentation, that is to say, fermentation takes place without the addition of yeast and consequently avoiding the loss of sixty-six *per cent.* of the original strength. The principal object of the manufacture is to produce a beer of a good keeping quality suitable for exportation to either hot or cold climates. It has been established by experience in brewing that one kilogramme of malt from good barley is equivalent to 25° by the Belgian densimeter inasmuch as it produces 25 litres of wort at one degree = 25°. Thus to make 5000 litres of beer at 2° $\frac{5}{10}$ would require 500 kilogrammes of malt weighing 25 degrees per kilogramme = 12,500 degrees. This malt is macerated in mash tuns of a capacity of 5720 litres of water heated to 75° C. We obtain after maceration and saccharification 5548 litres of wort at 2° $\frac{351}{1387}$ = 12,500 degrees. After the first boiling in the purifiers this quantity of wort is brought down to 5270 litres 60 at 2° $\frac{196}{527}$ = 12,500 degrees. After being subjected to the second boiling the same quantity is reduced to 5000 litres of beer at 2° $\frac{5}{01}$ = 12,500 degrees.

It may here be mentioned that the Belgian densimeter is the official instrument to which the above mentioned data correspond and which may be compared with the hydrometers of other countries, by taking as a standard 25° per kilo. of crushed or ground malt.

By the apparatus described, not only the mixing, purification, distillation, fermentation, formation of alcohol and carbonic acid are effected but also a thorough boiling of the beer by means of the filter divisions in the purifiers.

Thus the coction or boiling of the wort is effected by the two lower filters in the purifier whilst the third filter, in combination with the two first mentioned, effects the purification; the distillation, by which is understood the complete solution of the amylaceous matters, initiates the formation of alcohol which terminates by the repose of the beer in casks and commences the fermentation which is completed by a natural ferment during the coction, the natural result of the germination of the grain which we consider as a natural ferment, necessary and sufficient to obtain by solution, the distillation and purification of the wort, alcohol and carbonic acid without artificial fermentation which removes 66 °/o of the original strength, that is to say by the addition of yeast 66 °/o of the strength of the wort is removed and there only remains 34 °/o of its strength to pass into the tuns for the conversion of the sugar into alcohol and carbonic acid, whereas by our method the whole of the strength of the wort, that is to say 100 °/₀, is retained to pass into the tuns for the conversion of the sugar into alcohol and carbonic acid, as shewn by the preceding calculations.

Barley, hops, and isinglass, only are employed.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, we declare that what we claim is :

1. The herein described purifier apparatus with its filter divisions made preferably of copper and provided with an alarm whistle.
2. The mode of purifying the beer.
3. The compressed air refrigerator.
4. The method of conveying the beer into the various vats, reservoirs, and tanks constituting the apparatus.
5. The construction of the vats, reservoirs, and tanks.
6. The construction of the clarification vault with stoneware tanks.
7. The general construction of the vats, reservoirs, and tanks provided with copper taps and pipes and the general arrangement of the brewery.
8. The various other features indicated in the above description resultant from our experiments and researches.
9. The right to modify the arrangement and dimensions of the apparatus, vats, reservoirs and tanks and to vary their number and dimensions as well as to vary the proportions or composition of the beer, the time of distillation, purification, decantation, and storage.
10. The right to substitute for the barley hops and isinglass any other suitable materials to be used in the herein-described apparatus, reservoirs, vats, tanks, *etc.*

Dated October 13th 1891.

D. QUERTAIN.
H. BECKER.

By A. M. & Wm. Clark,
53, Chancery Lane, London, Patent Agents.

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